Project Title:	Subject:
CABRILLO PORT LNG TERMINAL	**Horizontal Directionally Bored (HDB) Nearshore Pipeline Project Marine Operations**

HDB Nearshore Pipeline Project
Marine Operations

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1 INTRODUCTION

BHP Billiton (BHPB) has submitted applications to acquire federal, state and local permits and approvals for the Cabrillo Deepwater Port Project, a Floating Storage and Re-gasification unit (FSRU) which will be sited in federal waters approximately 21 miles offshore of Port Hueneme, CA. Two new 24-inch diameter pipelines will deliver the restored natural gas product from the FSRU into the existing onshore natural gas pipelines owned by Southern California Gas Company. The new 24-inch diameter submarine pipelines will transit onshore via a horizontal directionally-drilled (HDB) pipeline crossing to landfall sites located either at Reliant Energy Ormond Beach or at the alternate Navy site. The objective of this document is to provide a summary of the marine operations required to conclude the HDB scope of work. The construction methodology described herein is based on well established local marine construction practices and jurisdictional agency requirements.

Additional project data can be found within supplementary studies including, “Preliminary Geotechnical Study Summarizing Subsurface Conditions at Southland Sod Farms”, BHBP document number WCLNG-BHP-DEO-GR-00-216-0 which examines typical subsurface conditions at the HDB site; construction procedures for the HDB boring operation are described in “Preliminary Construction Procedure and Design for Horizontally Directionally Bored Pipeline Landfall”, BHPB document number WCLNG-BHP-DEO-TP-00-0001-2; also included within the preceding report and as a stand alone rendering is a drawing titled “Preliminary Vessel and Equipment Layout for Offshore Support of Horizontal Directional Boring Operations, Cabrillo Port LNG Terminal Project”. The proposed drilling fluid monitoring plan is described in “Drilling Fluid Release Monitoring Plan for Horizontal Directional Boring”, BHPB document number WCLNG-BHP-DEO-TX-00-001-4, and the anchor mitigation plan is described in “Anchor Mitigation Plan for Horizontal Directionally Bored Nearshore Pipeline Project Marine Operations”, BHPB document number WCLNG-BHP-DEO-TX-00-001-1.

2 OPERATIONAL FUNCTION

The HDB nearshore project has been designed to provide protection for the two 24-inch submarine pipelines which continue from the FSRU to the nearshore terminus in approximately (-) 42 feet of seawater (FSW) to the shoreward landing at either the Reliant Energy Ormond Beach site or the alternate Navy site.

3 PROJECT DESCRIPTION AND SCHEDULE

3.1 GENERAL DESCRIPTION

The objective of this report is to provide preliminary data of the area of seafloor which would be impacted as a result of HDB operations and a proposed marine operational plan to accomplish the HDB scope of work.

3.1.1 Seafloor Area Impacted

Preliminary seafloor impact calculations have been devised for the nearshore HDB operations plan. The estimated square footage of seafloor impacted is provided by activity and spread as follows:

Description	Qty	Length	Width	Total
HDB Pipelay Barge Moorings	32	20-feet	60-feet	38,400 ft^2
HDB Pipelay Barge Support Vessel Moorings	6	20-feet	60-feet	7,200 ft^2
Exit Hole Barge Moorings	9	20-feet	60-feet	10,800 ft^2
Exit Hole Barge Support Vessel Moorings	2	20-feet	60-feet	2,400 ft^2
HDB Pipe Laydown / Installation	2	5,050-feet	6-feet	60,600 ft^2
HDB Transition Trench[1]	1	-	-	-

3.1.2 Marine Operations Plan

The near shore / draft limited HDB and pipelaying phases of this project would typically utilize three marine equipment spreads, including a nearshore / HDB pipelay spread, HDB exit hole barge spread, and a deepwater pipelay spread. The typical marine equipment spreads and sequence of events are further described in the following paragraphs.

Permits and approvals from multiple jurisdictional agencies would be secured prior to mobilization. Proposed vessel locations and associated pre-set temporary moorings would be published in the USCG *Notice To Mariners* and Joint Oil Fisheries Liaison Office (JOFLO) *Notice to Fishers*. Vessels would be equipped with safety and spill response equipment as well as trained personnel in accordance to their emergency action and incident response plans approved by the appropriate jurisdictional agencies. Deck equipment would be equipped with drip pans to preclude equipment fluid releases to the vessel deck. Anchoring operations would be conducted in compliance to a project-specific anchor mitigation plan which would require the use of surface navigation services to ensure accurate mooring.

The marine operations plan has been designed to minimize vessel traffic by supporting self-sufficient operations. It is anticipated that shore base logistics would be conducted from the Port of Hueneme or other port of opportunity. The project vessels would be mobilized and re-supplied with materials and provisions by material barge or support vessel. Upon project conclusion, the vessels would be demobilized at a port of opportunity.

1 Transition trench size requirements would be determined by the offshore contractor's design engineer.

Equipment spreads and a description of their activities are provided as follows:

Nearshore / HDB Pipelay Equipment Spread

The nearshore / HDB pipelay equipment spread would require one pipelay barge, three self propelled support vessels, and multiple materials barges. The self propelled support vessels would be utilized as required for specific services, and would move on and offsite as required.

The nearshore pipelay barge would be approximately 400 feet in length and would serve to support the fabrication / installation of the HDB pipeline sections. . Project specifications may require that the sections be fabricated and installed from seaward to shore, but it is possible that converse installation methodology (from shoreward to seaward) would be employed, which would require onshore fabrication of these sections. The HDB contractor's project execution plan will be carefully considered for efficiency and minimal environmental impact.

The HDB pipelay barge would be moored on location and it is anticipated that dependent upon equipment available at the time of installation, up to an eight-point mooring system may be required. Each mooring anchor would be approximately ten tons, and the pipelay barge would require a minimum of three four mooring events to conclude the HDB pipelay work. Pre-set temporary moorings would also be employed for the support vessels and materials barges. The HDB pipelay barge would be assisted to location by two tug or anchor handling towing / supply (AHTS) vessels, and at least one of these vessels would be equipped to provide navigation services required during mooring operations. Additionally, at least one of the smaller vessels can then serve as a grab sampling vessel as required during boring operations. Typical AHTS vessel lengths range from 190 to 225 feet and tug boats may range from 100 to 185 feet in length.

Materials barges would be utilized to provide re-supply of pipe and other project related materials as required to complete the fabrication and testing of HDB sections.

Each HDB pipeline segment would consist of a 36-inch diameter casing which protects the 24-inch diameter pipeline sections. The 24-inch pipe sections will be equipped with protective coatings and would include a tail section of approximately 550-feet which would remain on the seafloor outside of the directional bore after installation. The HDB pipeline sections would be fabricated and inspected in accordance to the project specifications.

Each pipe section would be fitted with a pig receiver on the seaward end and flooding/venting/hydrotest plumbing to allow gauging and hydrotesting of the sections prior to installation. After testing has concluded, the HDB pipelay barge moorings would be recovered and the spread would be released from the project. The spread would return to port and demobilize personnel and equipment.

Exit Hole Barge Equipment Spread

The exit hole barge equipment spread would require one work barge and three self propelled vessels. The work barge would be approximately 220 to 400 feet in length, and the three self propelled vessels would consist of AHTS vessels with lengths ranging between 190 to 225 feet and tug boats ranging from 100 to 185 feet in length. The barge would be moored at the location, and contingent upon equipment available at the time of project commencement, up to a nine-point mooring system may be required. Each anchor would be approximately ten tons, and a minimum of one mooring event would be required for each HDB shore approach pipeline. The self propelled support vessels would utilize pre-set temporary moorings when required.

The work barge would be assisted to the site by two of the vessels, of which a minimum of one would be equipped to provide navigation services during mooring operations.

Once moored, the barge would construct the transition trenches, utilizing either clamshell or suction dredging / sidecast techniques in compliance to contractor specifications and permit requirements.

The vessel moorings would be recovered and the equipment spread would be released from the project. The spread would then transit to port and demobilize personnel and equipment.

Deepwater Pipeline Equipment Spread

The deepwater pipelay equipment spread would require a dynamically positioned vessel (DPV) of approximately 600 feet in length, one AHTS vessel, a tug, barge and crew boat, which would interface at the HDB tail section(s). It is not anticipated that the deepwater pipelay spread support vessels would require mooring operations as support vessels can side tie or otherwise interface with the DPV as required to accomplish unloading of personnel and supplies in the field. The DPV would recover each completed and tested HDB shore approach pipeline via the tail section end from the seafloor and remove the pigging equipment. The DPV would then connect the tail section to the pipeline string. This operation may occur either before or after the deepwater pipelay installation, depending on pipelay contractor requirements, weather patterns, and other considerations.

3.1.3 Preliminary Project Schedule

The HDB marine operations preliminary project schedule is proposed as follows, and may consist of one - two twelve-hour shifts per day, with concurrent events as required for efficient operations:

Task	Location	Duration
Perform HSE Audit and Safety Training	Onshore	4 Days
Conduct Pre-operations HSE Meeting	Onshore	1 Day
Clear and Grade Site; Construct Launching Pit	Onshore	14 Days
Mobilize Equipment & Materials to Onshore Location & Stage	Onshore	3 Days
Install Pre-set Temporary Moorings	Offshore	1 Day
Mobilize Equipment & Materials to Nearshore Pipelay Barge/Materials Barge(s)	On/Offshore	10 Days
Moor Nearshore Pipelay Barge	Offshore	1 Day
Conduct Boring Operations/Casing Installation; Fabricate, Test, Install 24” Pipelines, Pig and Hydrotest - Note that vessel will un-moor and re-moor for a minimum of four mooring events	Onshore/Offshore	37 Days
Demobilize Nearshore Pipelay Barge	Off/Onshore	5 Days
Mobilize Equip/Materials to Exit Hole & Materials Barge(s)	On/Offshore	10 Days

Task	Location	Duration
Moor Exit Hole Barge	Offshore	1 Day
Construct Transition Trench	Offshore	2 Days
Conduct Offshore HDB Assistance Operations as Required for HDB Casing Exits	Offshore	37 Days
Demobilize Exit Hole Barge	Off/Onshore	5 Days
Deepwater Pipelay Spread Tie-in to HDB Sections	Offshore	2 Days
Deepwater Pipelay[2]	Offshore	TBD
Weather/Operations Contingency	Offshore	5 Days
Demobilize Onshore Location & Restore Site	Onshore	5 Days
Recover Pre-set Temporary Moorings	Offshore	1 Day
Post-project Documentation	On/Offshore	2 Days

2 Note that deepwater pipelay installation may commence or conclude at the HDB pipe tail section dependent upon contractor requirements, weather and other considerations. Pipelay duration would be predicated upon contractor's marine equipment spread.

3.2 GENERAL MARINE EQUIPMENT REQUIREMENTS

The marine equipment spreads selected must have the capability of:

- Sufficient deck area and capacity.
- Adequate mooring equipment.
- Self-sustained operations with minimal re-supply.

3.3 MARINE EQUIPMENT SPREADS

As discussed in Section 3.1.2, the HDB phase has been divided into the following construction phases and would typically employ the following equipment:

- Nearshore/HDB Pipelay Marine Equipment Spread:
  (1) Pipelay Barge, approx. 400' LOA
  (4) Materials Barges, approx. 240' LOA
  (3) Self-propelled support vessels
    - (1) Anchor Handling Towing Supply (AHTS) vessel, approx. 190 – 225' LOA, 15,000 BHP
    - (2) Tug Boats, approx. 100 – 185' LOA, 4,000-6,000 BHP

- HDB Exit Hole Support Barge Spread:
  (1) Work Barge, approx. 220 – 400' LOA
  (3) Self-propelled support vessels
    - (1) AHTS, approx. 190 – 225' LOA, 15,000 BHP
    - (2) Tug Boats, approx. 100 – 185' LOA, 4,000-6,000 BHP (each)

- Deepwater Pipelay Marine Equipment Spread:
  (1) Dynamically Positioned Pipelay Vessel (DPV), approx. 600' LOA, 25,000 BHP
  (1) Materials Barge, 240' LOA
  (3) Self-propelled support vessels
    - (1) AHTS, approx. 190 – 225' LOA, 15,000 BHP
    - (1) Tug Boat, approx. 100 – 185' LOA, 4,000-6,000 BHP
    - (1) Crew Boat, approx. 75 – 125 LOA, 1,500 BHP

4 AGENCIES, REGULATIONS/STANDARDS AND ENVIRONMENTAL ISSUES

4.1 AGENCY JURISDICTION

- The nearshore project area is within the jurisdiction of the California State Lands Commission (CSLC), California Coastal Commission (CCC) and United States Army Corps of Engineers (USACOE). Additionally, certain activities associated with the project would require approvals from the local office of the California Regional Water Quality Control Board (CRWQCB), and may be within the jurisdiction of other agencies, including but not limited to, California Department of Fish and Game (DFG), National Oceanic and Atmospheric Administration (NOAA) Fisheries, California Air Resources Board (CARB) / Ventura County Air Pollution Control District (VCAPCD), and local municipality requirements.

4.2 REGULATIONS AND STANDARDS

The HDB pipeline sections would typically be fabricated and installed in accordance with the latest edition, and supplements / amendments where relevant of:

- Project Specifications.
- Project-specific permits from jurisdictional agencies.
- Anchor Mitigation Plan.
- Drilling Fluid Release Monitoring Plan for Horizontal Directional Boring.
- American Petroleum Institute (API) Standard 1104-1999 Welding of Pipelines and Related Facilities.
- American Society of Mechanical Engineers (ASME) B31.8-2003, Gas Transmission and Distribution Systems.
- National Association of Corrosion Engineers (NACE) RP0169-2002 Control of External Corrosion on Underground or Submerged Metallic Piping Systems.
- NACE RP0402-2002 Field-Applied Fusion-Bonded Epoxy (FBE) Pipe Coating Systems for Girth Weld Joints: Application, Performance, and Quality Control.
- NACE RP0490-2001 Holiday Detection of Fusion-Bonded Epoxy External Pipeline Coatings of 250 to 760 µm (10 to 30 mils).

4.3 ENVIRONMENTAL ISSUES

4.3.1 Offshore Environmental Issues

Initial bathymetric surveys have not identified any hard bottom habitats or other resources that would be substantially impacted during mooring or HDB pipelay / pull in operations.

Vessel moorings and pre-set temporary mooring equipment would be installed and recovered in accordance to the anchor mitigation plan, which provides specific direction to minimize disturbance to the seafloor. Additionally, it is assumed that ocean currents would infill sediment to the HDB transition trench. Post-project site documentation would be conducted as a video inspection either by a diver handheld video camera or by a remotely operated vehicle (ROV) equipment spread mobilized to one of the project vessels. Video documentation would be submitted at the conclusion of the project.

5 DRAWINGS

The drawing below provides a graphic representation of the anticipated marine equipment anchoring locations required to complete the HDB installation operations.